CHARA VISIANII J. BLAZENCIC et V. RANDJELOVIC sp. nov. (CHARACEAE) FROM THE RIVER KRKA (CROATIA)

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ABSTRACT - Species *Chara visianii* sp. nov. that belongs to the species complex *Chara hispida* Linné is described in the paper. It differs from the others within complex by its morphological and ecological characteristics. Also, taxonomic position and status of *Chara hispida* var. *dalmatica* Visiani have been changed in *Chara visianii* f. *dalmatica* (Visiani) J. Blazencic et Randjelovic.

RÉSUMÉ- Une espèce nouvelle du genre *Chara, Chara visianii* sp. nov., a été trouvée dans la rivière Krka en Croatie. Dans le présent travail, l'analyse comparative des caractères morphologiques et écologiques de la nouvelle espèce est donnée. Le changement de position et de statut taxinomique de *Chara hispida* var. *dalmatica* Visiani en *Chara visianii* f. *dalmatica* (Visiani) J. Blazencic et V. Randjelovic est proposé.

KEYWORDS - *Chara visianii* sp. nov., *Chara hispida*, Charophyta, fresh-water algae.

INTRODUCTION

Investigating the Krka river, between tufa barrier of Roski Slap and Skradinski buk (the lake Visovac) at the depth of between 4 and 9 m, we have found an unknown species from the genus *Chara*, associated with *Lychnothamnus barbatus* (Meyen) v. Leonh. At first, we have defined it as *Chara hispida* var. *dalmatica* Vis. which has been found on the same locality by Visiani (1842). But, after careful and precise morphological and ecological analysis, we came to the conclusion that it was about new species which we named *Chara visianii* according to the famous botanist Roberto de Visiani, the first who remarked the difference between population of Charophytes living in the Krka and the others (Visiani, 1842).

MATERIAL AND METHODS

The investigation has been based on specimens collected in the Krka river, precisely in the lake Visovac, near by tufa barrier of Skradinski Buk. Sampling of the plant material was done with simple and efficaceous devices, hook- and rake-type designed

by the authors themselves (Blazencic J. & Blazencic, Z., 1991). Collected plants has been conserved immediately in 4% of formaldehyde and included in the collection of Institute of Botany and Botanical Garden "Jevremovac" in Belgrade where investigation and comparison with the other specimens from the collection has been done. The literature data has also been consulted (Migula, 1897; Pascher *et al*, 1925; Dambska, 1964; Wood & Imahori, 1964, 1965; Corillion, 1957, 1975; Gollerbach & Krasavina, 1983).

DESCRIPTION

***Chara visianii* J. Blazencic et V. Randjelovic sp. nov.**

Typus: In aquis fluminis Krka, *in stagnis* Visovac, *prope Cascata* Skradinski Buk (Croatia), 17 July 1990, J. Blazencic, s.n. (*Holotypus*: BEOU, *Isotypus*: BEOU).

Planta monoecia, incrustata, cauloidus prostratus cum ramis erectis ad 30 cm altis. Cauloidus fragilis, (1)1,5-2 mm in diametro. Cauloidis internodiis (excepti apices) aequalis aut parve longioribus quam phylloidiis. Cortex diplostichus, tylacanthus (cellulae primariae corticis parve prominentes). Aciculae solitariae, raro 2-3, centralis longior, laterales braeviores, papilliformae. Bistipulata, stipulae aequales, latis 2-3 pro longioribus. Phylloidi 8-10 per verticillos, recti et patentes, 5-7 articulari. Articuli phylloidorum terminales acorticales bicellulati. Cellulae-bracteae 5, 2 anteriores, elongatae, oogoniis aequalis aut brevioribus et 3 posteriores, papilliformae. Bracteolae 2, 1,5-2,5 mm longae, bracteis anterioribus saltem duplice longioribus.

Oogonia (750) 900-1150(1300) µm longa (excl. coronulae) et (600) 700-780 µm lata, spirae 12-13. Coronulae (110)130-200 µm longae, 220-270(320) µm latae in basim, cellulae coronularum conniventes. Oosporae brunneae, 650-790(850) µm longae, 380-440(480) µm latae, striae 10, cum exigue conspicuae costae, terminatae in uncis et cucumina basalia. Antheridia (350)400-450(480) µm in diametro, oogoniis 2-2,5 pro brevioribus.

Plant monoecious, incrusted, cauloid procumbent with erect branches up to 30 cm high. Cauloid fragile, (1)1.5-2 mm in diameter. Internodes (except apices) equal or scarcely longer than phylloids (branchlets). Cortex 2-cort., tylacanthous (primary cells of the cortex insignificantly prominent). Spine-cells conspicuous in terminal internodes, which are less than 1/4 of diameter of cauloid, inconspicuous or absent in lower internodes. Spine-cells solitary, rare numerous (2-3), central longer, lateral short, papilliform. Stipulodes in 2 tiers, equal, 2-3 times as long as wide. Phylloids 8-10 in a whorl, straight and patent, of 5-7 segments. Distal segments of phylloids are ecorticate, 2-celled. Bract-cells 5, anteriors 2, well developed, shorter or equal than oogonia, posteriors 3, very short, papilliform. Bracteoles 2, 1.5-2.5 mm long, at least 2 times as long as anterior bract-cells.

Oogonia (750)900-1150(1300) µm long (excl. coronula), (600)700-780 µm wide, convolutions 12-13. Coronula (110)130-200 µm high, 220-270(320) µm wide at base, cells of coronula connivent. Oospores brown, 650-800(850) µm long, 380-440(480) µm wide, striae of 10 inconspicuous ridges terminating in basal claws or cage. Antheridia (350)400-450(480) µm in diameter, 2-2.5 times as short ■ oogonia. (Fig. 1)

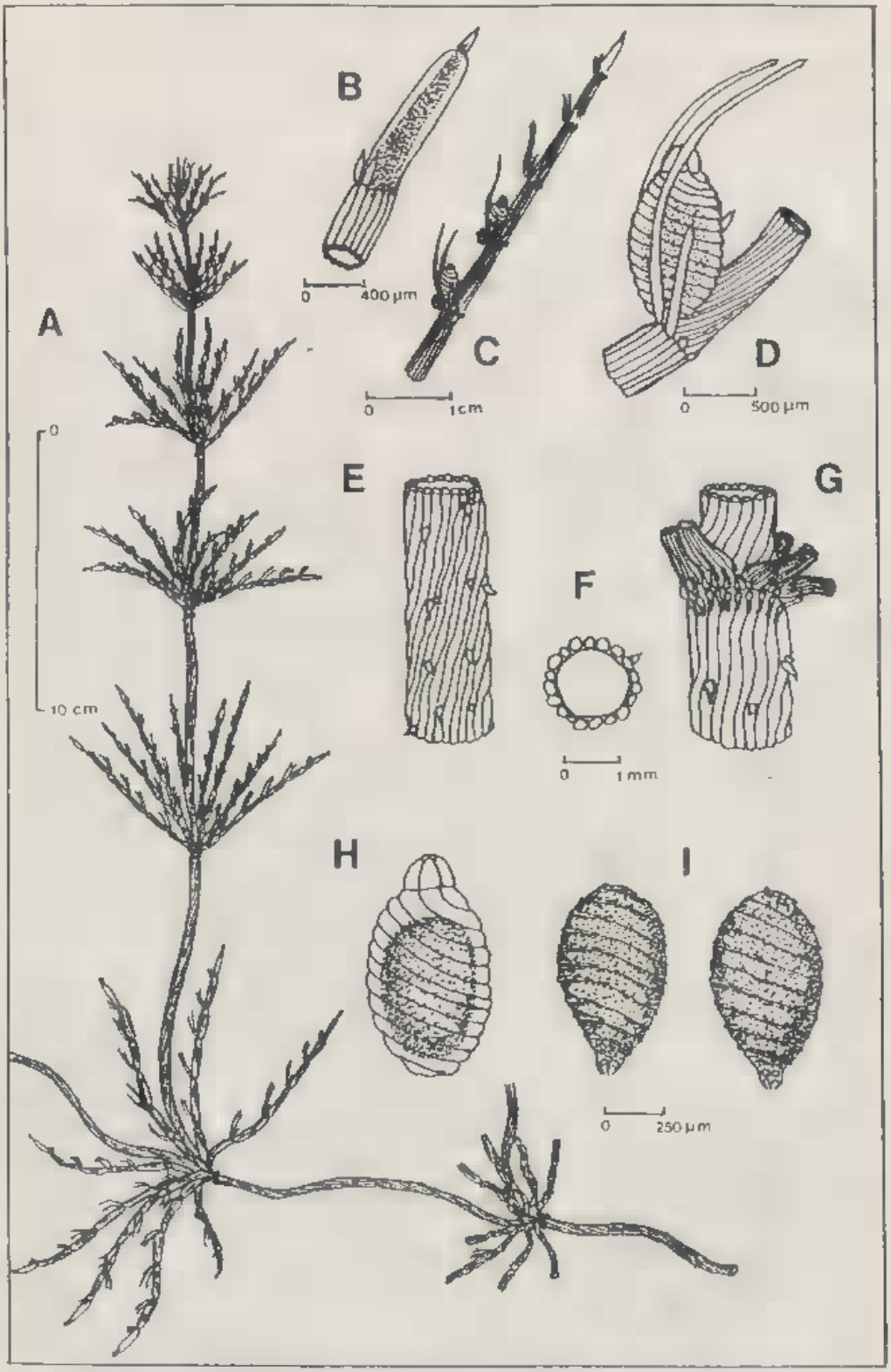

Fig. 1 - Morphological characteristics of the species *Chara visianii* J. Blazencic et V. Randjelovic sp. nov. A: habit, ■: distal segment of branchlet, C: branchlet, D: branchlet node bearing mature oogonia, E: segment of cauloid, F: cauloid cross section, G: cauloid node, H: oogonia, I: oospores.

General distribution: Southeastern Europe, Balkan peninsula, Croatia (Fig. 2A)

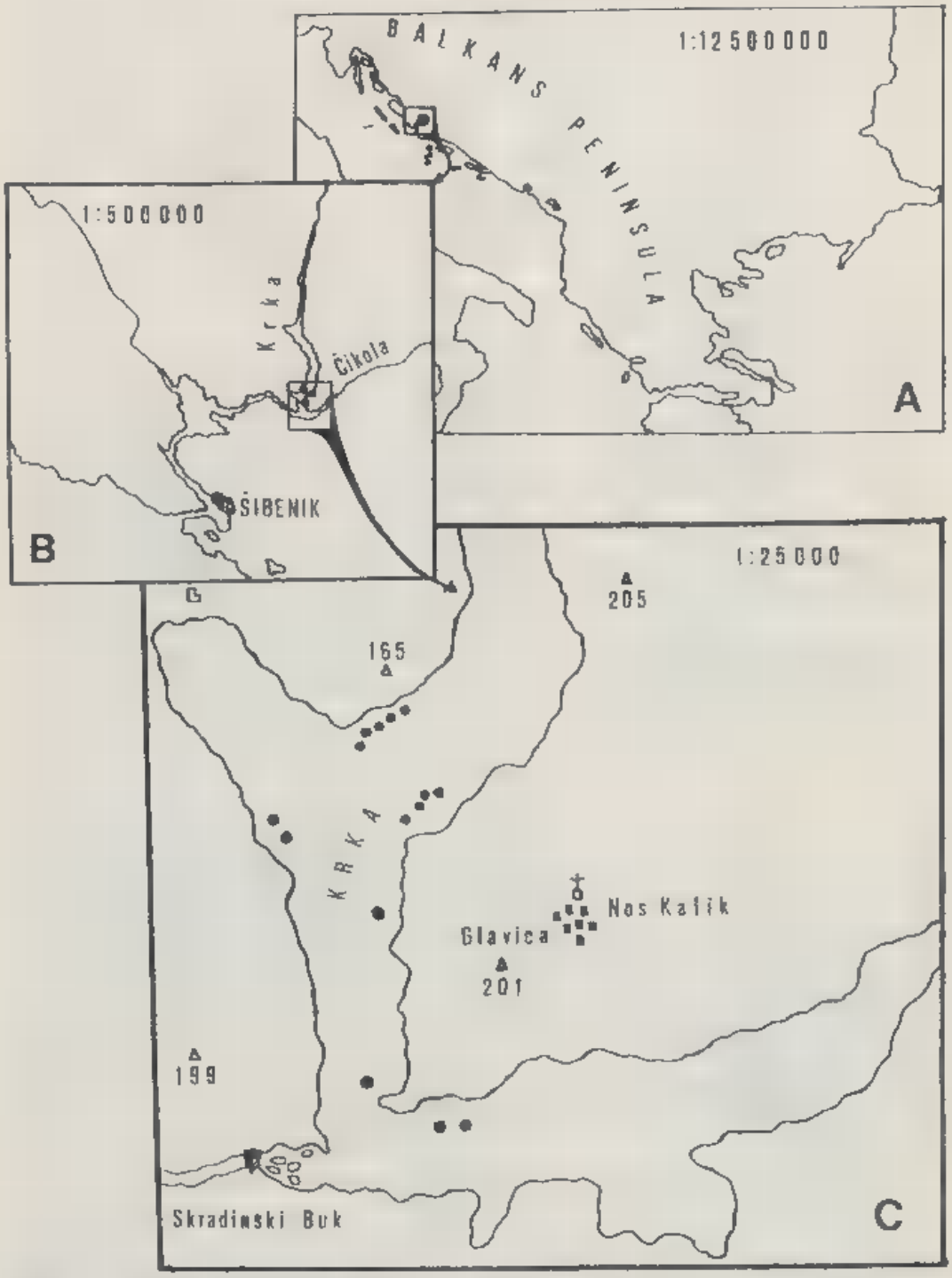

Fig. 2 - Distribution of *Chara visianii* J. Blazencic et V. Randjelovic, sp. nov. A: general distribution, B: distribution in the Krka river, C: distribution in the lake Visovac.

Local distribution: In the Krka river, not far from tufa barrier of Skradinski Buk, in the Visovac lake (Fig. 2B, 2C).

Habitat: In freshwater community *Chareto-Lychnothamnetum barbati* V. Randj., J. et Z. Blaz. 1993, on the calcareous geological bedock at the depth between (4)6 and 9(11) m (Tab. III).

RESULTS AND DISCUSSION

On the basis of certain external features (stipulodes in 2 tiers, presence of spine-cells, cortex tylacanthous and oospora brown) we have concluded that specimens, collected in the Visovac lake, belong to the species complex of *Chara hispida*. According to Wood & Imahori (1964, 1965) these species represent different intraspecific forms in the scope of the species *Ch. hispida*. European authors otherwise, each in his own way, distinguish following species within species complex: *Ch. hispida* L., *Ch. intermedia* A. Br., *Ch. polyacantha* A. Br., *Ch. baltica* Bruz., *Ch. rudis* A. Br., *Ch. schafneri* (A. Br.) T.F. Allen, *Ch. corfuensis* J. Gr. ex Fil. and others (Migula, 1897; Dambska, 1964; Corillion, 1975; Gollerbach & Krasavina, 1983).

Consulting the disposable literature on species complex *Ch. hispida* and comparing the results of authors' investigations on species *Ch. hispida* and *Ch. intermedia* from adjacent but ecologically different localities (Blazencic & Blazencic, 1990) with specimens from the lake Visovac, the authors have observed significant differences and come to realize that it has been a question of a new species from the genus *Chara*.

In the process of determination, species which had spine-cells longer than cauloid diameter *(Ch. hispida, Ch. polyacantha, Ch. corfuensis)* had to be eliminated at first; further on, *Ch. intermedia* and *Ch. rudis* were eliminated because of the form of coronula which were divergent to flat; finally, the size of reproductive organs was the eliminating factor for *Ch. schafneri* (oogonia 520-580 µm long and 315-360 µm wide, coronula 70-100 µm high and 135-142 µm wide in base, oospores 350-470 µm long and 200-300 µm wide and antheridia 250-400 µm in diameter.).

Beside morphological differences, collected specimens differed from the similar species also in ecological regard. Based on these differences the authors have found that population of Charophytes from the lake Visovac belongs to well isolated species named *Chara visianii* by the authors.

Results of comparative morphological and ecological analysis of specimens from the lake Visovac and samplings of similar species of *Ch. hispida* and *Ch. intermedia* from the adjacent localities (Blazencic & Blazencic, 1990: Blazencic *et al.*, 1990), have been disposed in tables I-III.

Near by Skradinski Buk at the depth of 1-1,5 m, the authors have collected a few specimens of plant of similar characteristics to the new species but with shorter internodes and more conspicuous spine-cells. Its morphological characteristics correspond to the description of *Chara hispida* var. *dalmatica* Vis. (Visiani, 1842). That is why the authors have changed its taxonomic position and status in *Chara visianii* f. *dalmatica* (Vis.) J. Blazencic et V. Randjelovic.

Table I - Comparative morphological characteristics of *Ch. visianii* J. Blaz. et V. Randj., *Ch. intermedia* A. Br. and *Ch. hispida* L. (reproductive organs).

Quantitative characters	*Ch. visianii*	*Ch. intermedia*	*Ch. hispida*
Length of oogonia (µm)	900-1150	860-1100	840-1000
Width of oogonia (µm)	700-780	650-750	600-650
Number of convolutions	12-13	13-14	13-14
Length of coronula (µm)	130-200	190-230	100-180
Width of coronula (µm)	220-270	310-350	220-330
Length of oospores (µm)	650-790	690-710	670-850
Width of oospores (µm)	380-480	430-460	390-440
Number of striae	10	12-13	11-12
Anteridia diameter (µm)	350-480	500-580	480-620

Table II - Description of some morphological features of *Ch. visianii* J. Blaz. et V. Randj., *Ch. intermedia* A. Br. and *Ch. hispida* L.

Characters	*Ch. visianii*	*Ch. intermedia*	*Ch. hispida*
Spine-cells	shorter than 1/4 of diameter of cauloid, 1 or 2-3, in this way central longer, lateral papilliform	longer than 1/2 diameter of cauloid, 1 or 2-3, but all well developed	longer than diameter of cauloid, numerous, well developed
Phylloids (Branchlets)	straight and patent, equal or scarcely shorter than internodes	straight and patent, much shorter than internodes	incurved and connivent, much shorter than internodes
Bract-cells	anteriors equal or shorter than oogonia, posteriors papilliform	anteriors exceeding mature oogonia, posteriors short, conical	anteriors longer than oogonia, posteriors rudimentary
Bracteoles	■ least 2 times ■ long as anterior bract-cells	mostly 2 times as long as anterior bract-cells	mostly 2 times as long as anterior bract-cells
Relatio between oogonia and antheridia	oogonia 2-2.5 times as long ■ antheridia	oogonia mostly 2 times as long as antheridia	oogonia mostly 2 times ■ long as antheridia
Coronula	connivent	spreading (divergent), rather flat	spreading (divergent), rather flat
Striae of oospores	with inconspicuous ridges	with prominent ridges	with prominent ridges

CONCLUSION

On the basis of these facts the authors concluded that they were dealing with a new species in the species complex of *Chara hispida, Ch. visianii,* distributed in Croatia in the lake Visovac. However, the authors believe that it may occur widely in other parts of the Krka river, on above the tufa barrier of Roski Slap.

Table III - Comparative table of some ecological conditions of habitats within *Ch. visianii* J. Blaz. et V. Randj., *Ch. intermedia* A. Br. and *Ch. hispida* L. are found.

Ecological conditions	*Ch. visianii*	*Ch. intermedia*	*Ch. hispida*
Water	fresh	brackish	fresh
Water depth	4-9 m	1-4 m	1-2 m
pH	7-7.4	7.8	6.6-7
Plant community	*Chareto-Lychnothamnetum barbati*	*Charetum intermediae*	*Lychnothamnetum barbati*
Transparency	3-3,1 m	3,5 m	to the bottom (1,2 m)

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